REPORT

OF THE

CHEMICAL ANALYSER TO GOVERNMENT, BOMBAY,

133170

FOR THE YEARS 1885.—1900

(except 1889)

Bombay:
PRINTED AT THE GOVERNMENT CENTRAL PRESS.

1886.

Digitized with financial assistance from the
Government of Maharashtra
on 11 July, 2017

INDEX.

	Para.
Work done during the year	2
Do. compared with previous years	3
Section I.—Medico-Legal.	
Cases classified	4
Human poisoning, general	5
Do. cases classified	6
Do. number of persons poisoned and number of deaths ...	7
Do. poisons found	8
Do. arsenic, general	9
Do. do. multiple cases	10
Do. do. single fatal cases	11
Do. do. other cases	12
Do. do. compound found not arsenious oxide	13
Do. pounded glass	14
Do. copper	15
Do. mercury and lead	16
Do. opium	17
Do. dhatura	18
Do. alcohol	19
Do. other poisons	20
Viscera, no poison found	21, 22
Food, &c., suspected to contain poison, do.	23
Cattle-poisoning, general	24
Do. poisons found...	25
Blood stains, &c.	26
Section II.—Potable Waters.	
General	27
Waters from Abu and Ahmedabad	28
Do. Ajmir, Belgaum, Berbera and Bijápur	29
Do. Bombay and Colába	30
Do. Deesa, Dhandhuka and Godhra	31
Do. Hyderabad, Kalyán and Karáchi	32
Do. Khárághoda and Nára	33
Do. Násik	34
Do. Pánchgani and Poona	35
Do. Quetta, Sholápur, and Sirúr	36
Do. Sorath, Talegaon, and Thána	37
Do. Rájputána-Málwa Railway	38
Do. Southern Marátha Railway	39
Section III.—Government Stores.	
General	40
Malt liquor	41, 42
Tea	43
Soap	44
Lime-juice	45
Sugar, preserved provisions and sundry articles of food	46
Disinfectants, oils, &c.	47
Sundry Ordnance Stores	48
Section IV.—Customs and Ábkárí Analyses.	
General	49
Alcoholic liquids	50
Opium and gánja	51
Salt	52
Explosives	53
Petroleum	54, 55
Section V.—Miscellaneous.	
General	56
Non-potable waters...	57
Limestones and limes	58
Miscellaneous mineral substances	59
Sundry substances	60
Final	61

REPORT

OF THE

CHEMICAL ANALYSER TO GOVERNMENT, BOMBAY,

FOR THE YEAR 1885.

To

THE SECRETARY TO GOVERNMENT,
GENERAL DEPARTMENT,
Bombay.

SIR,

As Chemical Analyser to the Government of Bombay, I have the honour to submit the following report for the year 1885, being the fifteenth Annual Report of this Department.

2. The following is a summary of the work done by the department during the year under report. 336 medico-legal cases involing the separate analysis or examination of 1,063 different articles were investigated and reported on. In addition, 108 samples of potable water, and 1,012 samples of Government stores and miscellaneous articles were examined or analysed, making a gross total of 2,183, different articles examined or analysed during the year.

3. The table which follows shows the number of medico-legal cases reported on, and other analyses effected, during each of the last five years. It will be seen from this table, that the number of articles forwarded to this office for examination, year by year, steadily increases:—

Class.	1881-82.	1882-83.	1883.*	1884.	1885.
Medico-legal cases	245	260	218	314	336
Potable waters	42	27	61	98	108
Government stores	314	540	681	384	348
Customs and Ábkári analyses				493	576
Miscellaneous	179	47	51	82	88
Total ...	780	874	1,011	1,371	1,456

* Nine months only.

Section 1.—Medico-Legal.

4. The 336 medico-legal cases referred to this office during the year 1885, were forwarded from 115 different stations, and may as usual be divided into three classes, *viz.*: (1) Cases of real or alleged poisoning of human beings, (2) Cases of real or alleged cattle-poisoning, and (3) Other cases, chiefly cases involving the examination of articles suspected to be stained with blood or other animal fluids. Of the 336 medico-legal cases referred to this office during the year under report, 187 belong to the first, 101 to the second, and 48 to the third of these classes. The table below gives corresponding figures for the past five years:—

Class.	1881-82.	1882-83.	1883.*	1884.	1885.
Suspected human-poisoning	148	159	138	169	187
Do. cattle-poisoning...	62	70	45	103	101
Blood stains, &c.	35	31	35	42	48
Total ...	245	260	218	314	336

*Nine months only.

5. *Cases of suspected Human-Poisoning.*—Of the 187 cases of this class referred for examination and report during the past year, some poison or other was detected in 102 or 53·9 per cent. This is slightly over the usual percentage of detections.

6. The table which now follows shows the general nature of the poison found in each of the 102 cases of this class, in which poison was detected; the cases being distributed according to the districts from which they were forwarded:—

Districts.	Arsenic.	Pounded Glass.	Other Mineral Poisons.	Opium.	Dhatura.	Other Organic Poisons.	Total.
Ahmedabad	...	...	...	...	...	2	2
Ahmednagar	2	...	1	...	...	...	3
Belgaum	6	...	...	...	1	...	7
Bombay	2	...	2	...	...	1	5
Broach	1	...	1	1	1	...	4
Dhárwár	11	1	3	...	1	...	16
Kaira	...	...	...	2	...	1	3
Kaládgi	2	...	...	...	1	...	3
Kánara	1	...	...	...	...	...	1
Khándesh	2	...	1	2	...	1	6
Násik	1	...	...	...	...	1	2
Poona	4	...	1	1	...	3	9
Ratnágiri	1	...	...	...	...	...	1
Sátára	3	1	...	4	1	2	11
Sholápur	...	...	...	3	...	1	4
Surat	...	...	...	...	...	1	1
Thána	4	...	1	1	...	...	6
Sind	3	...	...	1	...	...	4
Mhow and other Cantonments ...	...	...	...	2	...	...	2
Total ..	43	2	10	17	5	13	90
Native States	4	...	...	2	...	1	7
Central Provinces and Berars ...	4	...	...	1	...	...	5
Grand Total ...	51	2	10	20	5	14	102

7. As far as can be made out from the reports furnished to this office, the 102 cases of suspected human poisoning, in which poison was detected during the past year, included the poisoning of 153 persons, of whom 64 died. As will be seen from the table which follows, these numbers are much above the average of previous years:—

	1881-82.	1882-83.	1883.*	1884.	1885.
A.—Cases—					
Arsenic	39	41	31	47	51
Opium	10	2	17	9	20
Dhatura	2	4	5	4	5
Other poisons	20	24	18	23	26
Total Cases ...	71	71	71	83	102

*Nine months only.

	1881-82.	1882-83.	1883.*	1884.	1885.
B.—Persons poisoned—					
Arsenic	45	57	29	50	91
Opium	10	2	17	9	18
Dhatura	3	4	33	10	17
Other poisons	9	11	6	29	27
Total persons poisoned ...	67	74	85	98	153
C.—Deaths—					
Arsenic	23	28	18	22	32
Opium	9	1	15	8	18
Dhatura	...	...	4	1	...
Other poisons	4	7	2	3	14
Total deaths ...	36	36	39	35	64

*Nine months only.

8. Below is a more detailed statement showing the poison detected in each of the 102 cases referred to:—

Poisons.	Cases.
Arsenious oxide	... 46
Sulphide of arsenic	... 3
Arsenite of copper	... 2
Pounded glass	... 2
Red lead	... 1
Chlorides of mercury	... 4
Copper	... 5
Opium	... 20
Dhatura	... 5
Alcohol	... 4
Strychnia	... 2
Oleander	... 3
Cocculus indicus	... 1
Plumbagin	.. 1
Luffa tuberosa	... 1
Aconite	... 1
Cyanide of silver	.. 1
	102

and the following is a summary of the cases in which these poisons were detected:—

9. *Arsenic.*—As shown in the table following, para. 7, the 51 cases in which arsenic was detected during 1885, included the poisoning of 91 persons, of whom 32 or a little over one-third died. Comparing these figures with those for previous years, it will be seen that an unusually large number of persons were poisoned by arsenic during the year under report. A larger percentage, however, than usual of the cases were non-fatal. Hence the number of deaths from arsenical poisoning reported during the year is not very greatly above the average of previous years. The table following, para. 6, shows the districts from which each of the 51 cases in which arsenic was detected were forwarded. The deaths were thus distributed: Dhárwár 6, Thána 4, Berárs 4; Poona, Belgaum, Sátára, and Sind 3 each; Khándesh 2, Native States 2, and 1 each from Broach and Ratnágiri.

10. Of the 46 cases in which arsenious oxide was detected during the past year, 13 were cases of multiple poisoning in which altogether 57 persons, 10 of whom died, were poisoned. In each one of these 13 cases the poison appears to have been mixed with an article of food eaten by the sufferers. In five cases the precise nature of the article of food used as a vehicle for the poison was not stated. In three cases sweetmeat, in three others bread or flour, in one case a pudding, and in another crushed dates formed the vehicle. Of the 10 indivi-

duals who died six were children. Taking first the cases in which children were killed, these were: (1) A case from Khed (Poona District), in which arsenious oxide was detected in the viscera of a boy, and also in the viscera of a male adult who died in respectively nine and five hours, after eating sweetmeat given to them by a man, reported to be then in custody. (2) A similar case from Hubli (Dhárwár District), in which, also, a man and a child were poisoned by arsenious oxide contained in sweetmeat; only the child however died, death taking place in three hours after eating the poisoned food. In this case it was reported that on *post-mortem* examination, the mucus membrane of the stomach of the deceased child presented no abnormal appearance. (3) Another case from Hubli, in which two children, aged respectively three and nine years, were poisoned by a man in whose possession arsenious oxide was found. The younger of the two children died. (4) A third case from Hubli, in which 10 persons were attacked with symptoms of arsenical poisoning after eating a pudding prepared by a woman. Of the 10 persons one, a child, died. On analysis arsenic was found in the liver, but not in the stomach or contents of the stomach of the child. Arsenic was also detected in the matters vomited by some of the other persons poisoned in this case. (5) A case from Shikárpur (Sind), in which a man and three girls were poisoned. Of these the man died 40 hours, and one of the girls seven hours, after eating some food prepared by the wife of the former. The wife, when taken into custody, confessed to having put poison into the food, but stated that she had done so at the instigation of a man. (6) A case from Athni (Belgaum District), in which a child and two men were poisoned, of whom the former died. Besides the two adult deaths in respectively cases (1) and (5) above, in two other cases adults were killed, *viz.*, (7) In a case from Karád (Sátára District), in which a woman died shortly after eating some bread containing arsenious oxide: two other women were poisoned in this case but recovered; and (8) In a case from Anklesvar (Broach District), in which three men, one of whom died, were attacked by symptoms of arsenical poisoning after eating food in company. No death was reported in the remaining five cases: these were (9) A case from Háveri (Dhárwár District), in which five persons were poisoned by arsenious oxide contained in crushed dates; (10) A case from Gadag (Dhárwár District), in which three men were poisoned; (11) A case from Muddebihál (Kaládgi District), in which a whole family were poisoned by arsenious oxide contained in bread; (12) A case from Háveri (Dhárwár District), in which thirteen members of one family were poisoned by arsenious oxide contained in flour; and (13) A case from Shikárpur, in which a man and his father were poisoned by the wife of the former, who had been carrying on an intrigue with another man.

11. Twenty-one more of the cases in which arsenious oxide was detected were fatal cases in which one individual only was poisoned. In four of these cases, from respectively Thána, Nandurbár, Bhopáwar, and Laksmeshvar, the deceased individuals were male adults, but whether they were cases of suicide or homicide it is not possible to say from the reports furnished. Two more of the cases, *viz.*, one from Thána (a male adult), and one from Sátára (a female adult), were reported to be cases of suicide. A seventh case (from Bándra) also appears from the history to have been a case of suicide. Deceased was a peon employed in the Salt Department and was suspected of smuggling salt. He was taken to Sirkárkún's office, and while there was attacked by symptoms of irritant poisoning, dying soon afterwards. After deceased's death, his wife and mother asserted that before death he had stated to them, that he had been given some sweetmeat (which they alleged was poisoned) by the Jamádár in whose custody he was being conveyed to the Sirkárkún's office. In four of the remaining 14 cases the deceased individuals were females; in one of these, from Gadag (Dhárwár District), deceased was a widow, and *post-mortem* examination showed that she had been recently delivered. In another, from Chopda (Khándesh District), deceased was three months gone in pregnancy. In the third, from Ellichpur (Berar), death was reported to have taken place from snake-bite, and two punctures, about 1 inch apart, were pointed out by the police on the left arm of the deceased. In the fourth case, from Dhárwár, deceased appears to have been poisoned by arsenious oxide contained in food prepared by herself; she, however, appears not to have known that the food contained poison. The reports furnished with the remaining 10 cases all point more or less distinctly to homicide. In one of the 10, from Belgaum, the victim was a boy; in each of the

other nine the deceased individuals were male adults. In seven of the nine cases the poison was administered in food; in three of these, from respectively Khed, Bassein and Akola, wives were accused of poisoning their husbands. In a fourth case, from Chikodi (Belgaum District), it was stated that the deceased's "step-mother" was the accused party. It was not stated who was suspected in the remaining three cases, from respectively Sátára and Ellichpur (2). None of these seven cases possess any special feature of medico-legal interest. Of the remaining two cases, in one, from Vingurla, the usual symptoms of irritant poisoning were so far absent, that no one seems to have suspected what was the cause of death, until *post-mortem* examination showed intense inflammation of the stomach : 75 grains of arsenious oxide was found in the contents of the stomach in this case. In the other case, from Tatta (Sind), arsenical poisoning similarly does not seem to have been suspected until after the *post-mortem* examination. The usual symptoms of irritant poisoning were present in this case, but death was attributed to cholera, mainly apparently owing to the fact that four or five other persons were unaffected, who had partaken of food in company with the deceased, shortly before he was attacked by symptoms of poisoning.

12. The remaining 12 cases in which arsenious oxide was detected during the past year were all non-fatal cases, in which not more than one individual was poisoned. Of the 12, one, from Bombay, was a case in which a man attempted to commit suicide while in the custody of the police on a charge of theft. He was seen issuing from a latrine with particles of white powder adhering to his lips, and was immediately put under treatment. A second case, from Ahmednagar, was one in which a drug said to have been used in procuring abortion proved to be arsenious oxide. The whole of the remaining 10 cases appear to have been attempts at homicide by administration of arsenious oxide in food. In one of the 10 from Saundatti (Belgaum District), a woman was poisoned, and in another, from Kárwár, in which arsenious oxide was found in some dough; the sex of the individual poisoned was not stated. The other eight cases were cases of attempted poisoning of male adults. Three, from respectively Bijápur, Poona, and Háveri, appear to have been attempts by wives to poison their husbands by arsenious oxide introduced into bread. In two others, from respectively Talegaon and Amraoti, arsenious oxide was found in cooked food—in the Amraoti case in bread,—but it was not in either of these two cases stated, who was suspected to have introduced the poison. In a sixth case, from Ahmednagar, in which arsenious oxide was found in a mass of cooked meat, it was alleged that a person had been seen to put a white powder into the cooking pot in which it was being prepared. Of the two remaining cases, one came from Pálanpur. Accused in this case is alleged to have invited a man with whom he was on bad terms to go with him to the shrine of a Pir to partake of food in honour of his (accused's) deceased wife. At the shrine he is alleged to have prepared several plates of food distributing them to persons present. One only of the plates of food, *viz.*, that given to complainant, appears to have contained poison. Accused subsequently confessed to having put powdered tabasheer and dhatura seeds into the food for the purpose of killing complainant. The last case was one brought to my notice by the Bombay Police. A clerk in a public office complained that attempts were being made to poison him by the introduction of poison into the lunch brought by him to his office. Two masses of bread, stated to be portions reserved on two different dates from complainant's lunch, were each found to have powdered arsenious oxide sticking to them. Arsenious oxide was also found adhering to a piece of paper in which the complainant's lunch on a third date had, it was stated, been wrapped.

13. In five cases an arsenical compound other than arsenious oxide was detected, *viz :* (1) In a case from Belgaum, in which arsenite of copper was found in a quantity of curry. In this case a woman accused another of attempting to poison her, and her family. (2) In a case from Sorath, in which three men were attacked by symptoms of poisoning after eating bread made from flour containing arsenite of copper. (3) In a case from Gadag (Dhárwár District), in which both yellow sulphide of arsenic, and sulphate of copper was found in some sugar, a portion of which had been eaten by man who suffered thereafter from the usual symptoms of arsenical poisoning, but recovered. (4) In a case from Málegaon (Násik District), in which a mass of substance sent for examination proved to be

realgar or red sulphide of arsenic. No details were furnished with this case. (5) Lastly, in a case from Saundatti (Belgaum District), *post-mortem* examination of the exhumed body of a female revealed signs of recent delivery. Two pieces of thin stick, each about 2½ inches long, were found, one in the cavity of the uterus, the other lying in the vagina. Of these the former was armed, for about one inch of its length, with a layer of cotton containing sulphide of arsenic, and sulphide of arsenic was found to be present in a yellow patch cut from the lining membrane of the uterus, at the place where the stick was found. In this case, I understand, it was subsequently urged for the defence, that the stick had been introduced after death; one of the medical witnesses being of opinion that had such a piece of stick as that found in the uterus been introduced previous to expulsion of its contents, it would have been expelled therewith. Harvey, however (Bengal Medico-legal Report for 1871-72), mentions more than one case in which such a piece of stick was found after death in the emptied cavity of the uterus.

84. *Pounded Glass.*—This was detected in only two cases during the year, *viz.*, (1) In a case from Hubli, in which a man charged his wife with an attempt to poison him; in this case a quantity of fragments of pale pink glass, probably fragments of a bangle, were found in some dough alleged to have been prepared by the wife. (2) In a case from Sátára, some particles said to have been picked out of cooked food were found to be small angular fragments of green glass.

15. *Copper.*—This was detected in five cases. In two of the five, particles of sulphate of copper were actually found in articles of food, *viz.*, (1) In a case from Poona, in which the food was said to have been prepared by a wife for her husband; and (2) In a case from Dhulia, in which particles of sulphate of copper were found in some fragments of bread cakes. In two other cases copper was found in small quantity in articles of food. In one of these, from Nevása, it was detected in some cooked rice; in the other, from Háveri, in some ghee. In the Háveri case the copper seems to have been derived from the vessel in which the ghee was prepared. Lastly, also in a case from Háveri, sulphate of copper, alum and borax formed the contents of three packets found in the house of a woman accused of an attempt to poison a man.

16. *Mercury and Lead.*—Impure mercurous chloride (ruskapoora) was found in four cases. In each of two of these, from respectively Dhárwár and Bombay, it formed the contents of a packet found in possession of a person accused of procuring abortion. In the Bombay case other packets submitted for examination contained respectively aloes, castor-oil seeds, and sulphate of copper. In the third case, from Sháhápur (Thána District), a substance, produced by a woman who alleged it had been given to her by a man, to be put into the food of the man with whom she was living, proved on examination to be ruskapoora. Lastly, in a case from Broach, ruskapoora was found in a pill produced by a woman who alleged that some one had given it to her, to cause her injury. The only case in which lead was found during the year was a Bombay case, in which red lead formed the contents of one of a number of packets, found in the possession of a person accused of procuring abortion.

17. *Opium.*—Of the 20 cases in which opium was detected during the year, in 18 the drug was found in the viscera of deceased adults, nine of whom were stated to be females, and eight males. In one case, from Páliyád, the sex of the deceased was not stated. Five of the nine female cases and three of the eight male cases were reported as cases of suicide. The reports accompanying the remaining ten cases, although not expressly stating them to be suicidal, contained nothing indicating that homicide was suspected. The two cases in which opium was detected in matters other than viscera were: (1) A case from Bhadgaon, in which opium was detected in some goor; and (2) A case from Vinchúr, in which a mass of opium was forwarded for examination in a "criminal case". No particulars regarding either of these cases were forwarded to this office.

18. *Dhatura.*—The following is a summary of the five cases—all non-fatal—in which this poison was detected during the past year: (1) In a case from Belgaum several persons—precise number not stated—suffered from symptoms of dhatura-poisoning after eating food prepared from flour found on examination to

contain the alkaloid *daturia*. The accused in this case confessed to having mixed powdered dhatura seeds with the flour. (2) In a case from Bágevádi (Kaládgi District) the alkaloid *daturia* was found in some sweetmeat given by one man to another, who after partaking of it was attacked by the usual symptoms of dhatura poisoning. The motive in this case was stated to be to make the poisoned individual "mad on account of kept women." (3) In a case from Broach a woman confessed to having put powdered dhatura seeds in her husband's food. The husband and "others" who ate of the poisoned food were attacked. Dhatura seeds were found in accused's possession and identified. (4) In a case from Sátára, in which five persons—two of them children—were poisoned, the alkaloid *daturia* was found in some fragments of bread cakes. Some flour sent at the same time and said to be a portion of the flour from which the bread in question was made, was found to be free from poison. (5) Lastly, in a case from Hubli (Dhárwár District), three children were poisoned, and dhatura seeds, whole and in powder, were found in possession of the accused. Some powder scraped from a grinding stone belonging to the accused was also found to contain *daturia*.

19. *Alcohol.*—In four cases alcohol was found in the contents of the stomach of male adults under circumstances indicating that alcoholic poisoning more or less contributed to the fatal result. The four cases were: (1) A case from Igatpora, in which alcohol in considerable quantity was found in the contents of the stomach of a European engine-driver. It was reported in this case that deceased while intoxicated had swallowed a portion of the contents of a bottle of liniment subsequently ascertained to be soap liniment. Camphor, one of the ingredients of soap liniment, was, as well as alcohol, found in some quantity in the contents of deceased's stomach. (2) A case from Kaira, in which a man died suddenly after a drinking bout. *Post-mortem* examination in this case revealed hypertrophy and valvular disease of the heart. (3) A very similar case from Rájkot. (4) A case from Sháháda (Khándesh District). In this case alcohol was detected in some quantity in the contents of the stomach of a man who had apparently died from wounds on the head and other parts of the body. Three wounds on the genitals were stated to have been present in this case.

20. *Other Poisons.*—Three cases of poisoning by *oleander* were reported during the year. Two of these, from respectively Pandharpur and Sátára, were cases of suicide. In the third case, from Dholka (Ahmedabad District), six children while tending cattle were attacked with symptoms of poisoning, apparently the result of their having eaten portions of one of the poisonous oleanders. Two of the six died. *Strychnia* was detected in two cases, *viz.*, (1) In the contents of the stomach and liver of a young female who, it was reported, had committed suicide by swallowing powdered nux vomica seeds. This case was sent up from Sásvad (Poona District). (2) In a case, which occurred in Bombay, where five prisoners, four of whom died, were accidentally poisoned by strychnia administered to them in mistake for cinchona alkaloids. The five remaining cases in which poison was detected during the year were as follows:—(1) *Aconite* was detected in the viscera of a dog forwarded from Indápur (Poona District). In this case it was reported that a man gave some curry to another; the latter noticing a peculiar taste about it gave it to his dog. Shortly afterwards the dog died and its viscera were sent for examination. (2) *Cyanide of silver* was detected in a case of attempted suicide sent up from Poona. In this case medical aid was obtained very soon after the poison was taken and the patient recovered. (3) In a case from Sátára of death after abortion, *plumbagin*, the characteristic principle of plumbago rosea and zeylanica, was detected in a lump of paste found lying in the vagina of the deceased. In this case arsenic also was detected in minute quantity in the liver. (4) In a case from Mhasvad (Sátára District) some bulbs, the internal administration of which it was stated had proved successful in causing abortion, had all the appearance of bulbs belonging to a plant of the natural order Cucurbitaceæ. One of these bulbs was kindly grown for me by Dr. Dymock who ultimately succeeded in identifying it as a bulb of the Momordica cymbalaria or Luffa tuberosa (Vern. *Kadawanchi*). A similar case was reported last year from Bágevádi (Kaládgi District). (5) Lastly, in a case from Ahmedabad, in which a Hakim was suspected of having caused the death of a person whom he was treating for dysentery, Cocculus indicus berries, nux vomica seeds, and Cannabis indica were identified among matters found in the possession of the suspected party.

21. Of the cases in which no poison was detected 54, equal to nearly 30 per cent., of the whole number of cases of suspected human-poisoning, were cases in which the matters forwarded for examination consisted of the viscera of persons deceased. The corresponding percentage for 1884 was 31·3 per cent. As usual these 54 cases may be divided into three classes, *viz:* 1*st*, cases in which from the reports forwarded the balance of evidence appears to be distinctly in favour of death being due to injury or disease; 2*nd*, cases in which while there is nothing to show that death was due to disease or injury, there is at the same time nothing to show that poison was the cause of death; and, 3*rd*, cases to which a certain amount of suspicion of poisoning attaches. Of the 54 cases 33 belong to the first, 11 to the second and 10 to the third class. Of the 33 cases of the first class, 10 were cases in which the bodies of individuals (8 females, 1 male and 1 child) were found in tanks or wells, under such circumstances as to give rise to reasonable suspicion that drowning was the cause of death. In 11 cases the cause of death appears to have been disease. In six death was alleged to have followed abortion or an attempt to procure abortion. In three death appears to have been due to snake-bite, and in the remaining three cases death seems to have been the result of respectively strangulation, hanging, and suffocation. None of the cases of death from drowning call for any special remark. Of the 11 cases of death from disease two may be specially mentioned, *viz.*, (1) A case from Shikárpur, in which the viscera of a man who had been ill for three years, and for a month before his death confined to his bed, were sent for examination. There seemed to be no doubt but that death was due to disease. A man, however, who had some dispute with deceased's wife, spread, in order to annoy her, a report that she had poisoned her husband; hence an analysis was requested. (2) A case from Kaira. In this case the Civil Surgeon reported that deceased had died from a complication of diseases. Shortly before death, however, deceased had accused a man of poisoning him by putting dhatura seeds in his food. On this accused confessed to having done so. No trace of dhatura or of any other poison could be detected in the viscera, and had deceased been killed by poisoning with dhatura, he would hardly have been able to make the accusation he is reported to have made. Of the six alleged abortion cases in two, from respectively Gokák and Karád, abortion does not seem to have occurred, as in both it was stated that on *post-mortem* examination the uterus appeared "normal." In two, from respectively Sásvad and Párola, death was reported to be due to hœmorrhage after abortion, and in the remaining two, from respectively Pandharpur and Shevgaon, there was nothing to indicate that abortion had been induced by the administration of drugs. The single case in which suffocation was reported to be the cause of death was forwarded from Bijápur, and was a case in which it was alleged an infant had died suddenly while taking the breast. The mother at once reported the death to the Police, and there seems to have been no suspicion of foul play. The case of strangulation came from Bárámati. A young female was found dead with marks of violence on her body and marks indicating compression about the throat. It was reported that she had shortly before death been beaten by her husband, and might therefore, it was supposed, have committed suicide by poison. The history of the hanging case from Dholera is rather a remarkable one. The body of a man was found hanging to a tree. Three men who were seen in company with the deceased shortly before his death were arrested and made, it was reported, a statement to the effect that as they were walking along with the deceased he began to stagger, and on their asking what was the matter he told them that he had taken opium in order to commit suicide. On this they, so they stated, thinking that they would be accused of causing deceased's death, hung his body to the tree where it was found.

22. Of the 11 cases of the second class, in seven the fact that death occurred suddenly appears to be the chief, or only, ground of suspicion. No history accompanied the viscera forwarded for examination in the other four cases. Of the 10 cases of the third class, two were cases in which infants under treatment for disease died more or less suddenly, and in which the circumstances were such, as to raise a doubt, as to whether death was due to disease, or to the effects of an overdose of opium administered without criminal intent. Three more were cases of suspected opium-poisoning in adults. In three there was a certain amount of suspicion of irritant poisoning; one of these, however, was pro-

bably a case of fish poisoning. The remaining two cases were: (1) A case from Sinnar, in which the ashes of a burnt body were forwarded for examination, and (2) A case from Udaipur, in which it was alleged a young female had committed suicide by poison. This case, as no portions of the solid viscera were forwarded for examination, may have been one of poisoning; but whether this was so or not it is impossible to say, as no information beyond what has just been stated was forwarded with the case.

23. Of the 32 cases in which matters other than viscera were submitted for examination, and in which no poison could be detected, six were cases in which substances, mostly white powders, were identified as non-poisonous substances. Four were cases in which earth stated to be mixed with vomit was the only substance submitted. The remaining 21 were cases in which articles of food, drink or medicine were forwarded for analysis, mostly on very trifling grounds. In two of these cases, however, persons accused were reported to have confessed to having mixed arsenic, with the article of food forwarded for examination.

24. *Cases of real or alleged Cattle-poisoning.*—One hundred and one cases of this class were submitted for examination and report during the past year, and in 54 of these poison was detected. So far as can be ascertained from the reports furnished the 54 cases in which poison was detected included the poisoning of 60 animals,—all horned cattle. How these figures compare with those for previous years will be seen from the table below:—

Year.	1879-80.	1880-81.	1881-82.	1882-83.	*1883.	1884.	1885.
Number of cases referred ...	112	86	62	70	45	103	101
Number of detections ...	84	49	39	37	29	58	54
Animals killed—							
Ahmednagar	3	1	1	14	7	8	13
Belgaum	6	2	...	...	...	...	6
Kaládgi (Bijápur)	9	4	2	...	3	2	3
Khándesh	...	1	2	3	...	5	3
Násik	22	8	9	10	5	7	3
Poona	11	8	6	8	5	7	9
Sátára	5	...	1	1	9	12	8
Sholápur	5	3	4	4	2	1	6
Surat	6	5	...	...	1	3	6
Other districts	7	8	9	13	8	6	3
Total Animals killed ...	74	40	34	53	40	51	60

* Nine months only.

25. Twelve of the cases in which poison was detected, were cases in which more than one animal was killed. Four of these came from the Ahmednagar district, two each from Belgaum, Sholápur and Sátára districts, and one each from Poona and Surat districts. As usual, in the great majority of cases of this class in which poison was detected, arsenious oxide was the only poison found. In three cases, however, red lead as well as arsenious oxide was detected, and in one case arsenious oxide was found, mixed with pounded glass. In one case, from Poona, strychnia was found in the viscera of a buffalo, and in each of two cases from Sátára substances alleged to have been used as cattle-poisons proved on examination to be seeds of the poisonous Cerbera thevetia, or yellow oleander. In one of these two cases whole seeds alleged to have been taken out of the mouth of a buffalo were forwarded for identification. In the other some pale yellow oily fragments of vegetable matter were found to be fragments of the seed-kernels of the plant. In this last case, what first excited suspicion as to the nature of the matter under examination was the fact that when boiled with strong hydrochloric acid a deep bluish green coloration resulted. This it was suspected might be the Thevetin blue reaction mentioned by Warden (Bengal Chemical Examiner's Report, 1881-82). Some seed-kernels of the Cerbera thevetia were

therefore obtained, and these when compared with the suspected substance proved to be identical therewith. Both were boiled with alcohol, the solution filtered and evaporated to dryness, and the residue washed once or twice with ether. The washed residue of both was then found to have the following characters: (1) Boiled with strong hydrochloric acid it gave a deep bluish green coloration at once destroyed by oxidising agents, *e. g.*, permanganate of potash solution; (2) treated with strong sulphuric acid a rich crimson tint was slowly developed, the crimson changing to deep green at the edges, on exposure to air.

26. *Cases in which articles suspected to be stained with blood or other animal fluids were forwarded for examination.*—Forty-eight cases of this class were referred for report during the past year involving the examination of 159 different articles. In one of these cases, from Bágevádi, spermatazoa were detected in certain stains on the *sári* of a girl aged 13 or 14 on whom it was alleged a rape had been committed. In another case some stains on the *sári* of a woman, who it was alleged had been raped, proved on examination to be stains made with starch paste. In 17 cases blood was found on articles of clothing only, and in 11 on matters other than articles of clothing. The blood-stained articles in these last 11 cases included 3 knives, 2 swords, 2 axes and 2 clubs, and in 3 cases blood was found on earth and stones. In one case only the blood discovered proved to be other than mammalian blood, *viz.*, in a case where some blood-stained reeds and earth from a place where it was alleged a murder had been committed, formed the matters submitted for examination. Of the 28 cases in which blood was detected on the articles forwarded, 20 appear to have been cases of murder or assault, six were cases of alleged rape, and two were cases of alleged causing of abortion.

Section II.—Potable Waters.

27. Altogether 108 samples of water were examined as to suitability for potable purposes during the year. Of these 86 were sent solely for examination as to their fitness or otherwise in this respect, and 22 were sent by various Railway Companies to be examined both as to suitability for potable purposes, and fitness for use in locomotive boilers. The table following this section is a summary of the results obtained so far as they bear on the question of the potability or otherwise of these 108 samples.

28. Referring to the table, analysis No. 1 shows the results obtained on examination of a sample of well water forwarded by the Mount Abu Municipal Committee. The objectionable point about this sample is the high figure for albumenoid ammonia (·54 parts per million) yielded by it. Analyses 2 and 3 shows the results obtained on examination of two samples of water from wells at Sumeri forwarded by the Executive Engineer, Abu Division, Rájputána-Málwa Railway. Both samples were good, No. 3, from a new well, being better than No. 2. Analyses 4 to 17 are of samples of water from Ahmedabad. Of these 4 and 5 are analyses of Sábarmati river water, collected at different points on the river, and forwarded by the Ahmedabad Municipality. Both are good potable waters yielding exceptionally low ammonia results. Nos. 6, 8, and 9, are all three samples of well water forwarded by the Commissariat Department, one only, *viz.*, No. 9, is classable as good. No. 7 was forwarded by the Public Works Department and was described as from a kutcha well on the site of the new Military Hospital; it shows exceptionally little evidence of organic contamination. Samples 10 to 18 were forwarded by the Ahmedabad Municipality. Of these No. 10 was stated to be from the Kankaria tank and was extremely bad. No. 11 was taken from the Sábarmati river at the pumping station. It is in every way of worse quality than samples 4 and 5 from the same river. Samples 12 to 17 appear to have been taken from various points on the Sábarmati river or from wells near it. With one exception, *viz.*, No. 14, from a well sunk in the bed of the river near the Bheel's burning ground, all were of good quality. No. 18 was described as from an underground masonry cistern. It yielded less total dissolved solids than any of the Ahmedabad samples and showed very little organic contamination.

29. Samples 19 and 20 were respectively a filtered and unfiltered sample from a well at Ajmere, and were forwarded for analysis by the Brigade Major, Ahmedabad: both yielded suspiciously high albumenoid ammonia results. Samples

21 and 22 were forwarded by the Mámtatdár of Chikodi (Belgaum) and were samples of water drawn on different dates from the Yamakanamardi tank. Both gave low results for total solids, but suspiciously high albumenoid ammonia results. Sample No. 23 was drawn from the Dubar springs at Berbera on the Somáli Coast. These springs, it was stated, formed the water-supply of the port. The sample yielded a comparatively large amount of total dissolved solids, but showed little organic contamination. Samples 24 and 25 both came from Bijápur; the first was forwarded by the Superintendent, Bijápur Extra-mural Convict Gang, and was taken from a well used by the prisoners. The second was sent by the Executive Engineer, and was stated to be from a newly excavated well in the vicinity of the Police lines at Bijápur. Both samples were found to be of good quality.

30. Sample No. 26 was forwarded by the Principal Medical Officer, Bombay and Baroda Railway. It was stated to be from a well at Goregaon, and was forwarded in consequence of an outbreak of fever among the Company's employés at that station. The sample, however, proved on analysis to be of good quality. Sample No. 27 was taken from a tank in the compound of a Hindu temple at Byculla, Bombay. It, as will be seen from the analysis, proved to be quite unfit for potable purposes. Samples 28, 29 and 30 were forwarded from villages in the Uran Zillah of the Kolába Collectorate in connection with cholera outbreaks; the first two yielded high albumenoid ammonia results, and are classed as bad.

31. Samples 31, 32 and 33 were forwarded by the Medical Officer in charge of the Station Hospital, Deesa. Nos. 31 and 32 were described respectively as a filtered and unfiltered sample from the Royal Artillery Hospital well, and No. 33 as from a well from which water used in preparing sodawater is drawn: all three samples were found to be of good quality. Samples Nos. 34 and 35 were examined at the request of the Sanitary Department. Both were taken from the same well at Dhandhuka, No. 34 before, and No. 35 after, thorough cleaning of the well. The cleaning appears to have had little effect on the inorganic impurities present on the water, but to have enormously reduced the organic contamination. Before cleaning the water gave the following ammonia results: free 38·40 parts and albumenoid 1·60 parts per million. After cleaning these figures became reduced to respectively ·03 and ·14 parts per million. Samples 36, 37 and 38 were drawn on the same day from different points of a large tank at Godhra. All three were bad, showing much organic contamination. This, however, was greatest in sample No. 36 and least in sample No. 38.

32. Samples 39 and 40 were forwarded by the Manager, H. H. the Nizám's State Railway; No. 39 was described as from a well at Wádi and No. 40 as from the Seram river. No. 39 proved to be a good potable water; No. 40 showed much organic contamination and was classed as bad. Sample No. 41 was a specimen of extremely bad water from a ditch at Kalyán. In the water of this ditch it was stated "the Mahomedan rice merchants wash grain previous to grinding it". Analyses 41 and 42 show the results obtained on examination of water from wells in Karáchi Jail. Both contained very considerably more dissolved saline matter than is permissible in a good potable water. Sample No. 44 was also forwarded from Karáchi and was stated to be a sample of "drinking from the Chahro, a branch of the Meerwah canal in the village of Manji Ladho Gujo in the Mirpur Baloia Táluka, where cholera was most virulent." This sample, it will be observed, contained only 10·50 grains per gallon of total dissolved solids, and showed exceptionally little evidence of organic contamination.

33. Samples 49 and 50 were both samples of water from the new tank at Khárághoda. Both yielded suspiciously high ammonia results. No. 50, a sample drawn from the tank in May, showed more mineral and organic contamination than No. 49, drawn in January. Samples 47 to 52 were forwarded by the Superintendent, Nára District Jail. Of these the first four were drawn apparently from various wells in the neighbourhood, of the Samara branch of the Nára canal: all were bad. The other two were sent in September, and were described, No. 51 as from a well lately constructed near the Jail Camp, and No. 52 from the branch canal close to the same. Of these two the latter proved to be by far the best of the whole six samples.

34. Samples 53 to 62 were all forwarded by the Collector of Násik Nos. 53 to 57 were drawn in February from various wells and tanks at Trimbak

all were very bad. No. 64, from the Kushavrita tank, gave the following exceptionally high ammonia results: free 28·16 and albumenoid 5·32 parts per million. No. 58 was a sample of drinking water from a well at Pokhari in the Nándgaon Táluka. It also showed much organic contamination. Samples 59 to 62 were drawn from a well and tank on Anjineri hill. In forwarding the first two of these samples, both of which proved to be extremely bad, the Collector writes: "Two cases of typhoid fever, contracted apparently on the hill, ended fatally." The affected individuals were Europeans who had been residing on the hill. The second two samples were drawn from the same well and tank after they had been cleaned. A very great improvement in the quality of the water resulted, it will be noticed, from the measures adopted.

35. Samples 63 and 64 were forwarded by the Superintendent of Pánchgani. Both were drawn in March from the public well at that station, No. 63 being taken from the well in the early morning and No. 64 during the day, after the well had been used by the public. Both samples were fairly good, and, contrary to what might have been expected, the second sample yielded slightly better results than the first. Samples 65 to 67 were forwarded by the Deputy Sanitary Commissioner, Central Registration District, from Pandharpur; No. 65 appears to have been taken from the river, and Nos. 66 and 67 from the water-supply of the town. The river water (No. 65) was the only good sample of the three. Samples 68 to 71 were forwarded by the Medical Officer in charge of the District Jail Hospital, Poona. Of the four No. 68 was a sample of Kartruz water from the Jail aqueduct, and the other samples of Khadakvásla water, as supplied to Poona City. There had been an outbreak of cholera in the latter, but the Jail population had been tolerably free from the disease. All four samples, so far as could be ascertained by analysis, were good. Sample 72 was drawn from the river Mula at Poona in May; it appears to be just on the line between a good and a bad potable water.

36. Analyses 73 to 76 show the results obtained on examination of samples of water from Quetta. No. 73 was stated to be drawn from the pipe of the Club well, and No. 74 from the reservoir below the pipe. No. 75 was collected from a spring below the General's house, and No. 76 from the Hanna river. Of the four samples the spring water was by far the worst and was decidedly bad. Samples Nos. 77 and 78 were forwarded by the Executive Engineer for Irrigation, Sholápur Division; they were described as from the Ekruk tank, but were labelled No. 77 as from the centre of the stream in the canal near the water-works, and No. 78 from the surface of the same. Both were good. Samples 79 and 80 were forwarded by the Executive Engineer for Irrigation, Poona Division; No. 79 was described as from a well under construction for the water-supply of Sirúr. This, as will be seen from the analysis, proved to be much too highly charged with saline matter to be fit for potable purposes. No. 80 was sent subsequently, and was taken direct from the river at Sirúr. It was found to be much better than sample No. 79, containing only 21·7 grains per gallon of total solids instead of like No. 79, 204·4 grains per gallon. The albumenoid ammonia results yielded by both samples were however suspiciously high.

37. Sample No. 81 was collected from a well newly sunk at Lackapadar in Sorath. This water gave rather a high free ammonia result, but was otherwise good. Samples 82 and 83 were forwarded by the Deputy Sanitary Commissioner, Central Registration District. These were stated to be both from the same tank at Talegaon, No. 82 being drawn from the place at which drinking water is collected, and No. 83 from the place at which cattle are watered: both were bad, No. 83 being slightly worse than No. 82. Sample No. 84 was forwarded by the Collector of Thána, and was described as a sample of water from a well in Murbád Táluka. Analysis showed it to be of fair quality. Samples 85 and 86 were collected in respectively January and April from a well at Takhusha near Zailla on the Somáli Coast. Both of these samples also appeared to be of fair quality.

38. Of the next 15 samples (Nos. 87 to 101) 14 were forwarded by the Executive Engineer, Abu Road Division, and one (No. 100) by the Executive Engineer, Ajmere Division of the Rájputána-Málwa Railway: all had to be classed as bad. Nos. 90 and 99 might possibly, however, by attending to the surroundings of the wells from which they were drawn, become of fair potable

quality. The majority of these samples were further examined as to suitability for use in locomotive boilers (*see* paragraph 58).

39. The first six of the remaining seven samples were collected from wells at various stations on the Southern Marátha Railway. None of them were very bad. Two, Nos. 103 and 106, were classed as good. The last sample was sent from Karáchi by the Sind, Punjáb and Delhi Railway Company. It was quite unfit for potable purposes. Five of these samples were further examined (*see* paragraph 58):—

Number.	Station.	Date of Collection.	Source.	Grains per Gallon.		Parts per Million.		Column added by order of Government	Sediment.
				Total Solids.	Chlorine	Ammonia.			
						Free.	Albuminoid.		
1	Mount Abu	May	Well	9·8	2·17	·03	·54	Bad	Abundant.
2	Abu Road	October	Sumeri, old well	31·50	9·03	·04	·18	Good	Scanty, paramecia.
3	Do.	Do.	Do. new well	35·00	7·70	...	·06	Do.	Do.
4	Ahmedabad	January	Sábarmati river, Sháhibag.	24·5	5·04	·03	·04	Do.	Scanty, protozoa.
5	Do.	Do.	Sábarmati, Hansole	23·3	5·04	·04	·05	Do.	Do. do.
6	Do.	February	Cattle lines well	24·5	3·57	·13	·38	Bad	Do. do.
7	Do.	April	New hospital well	36·4	2·52	...	·06	Good	Do. do.
8	Do.	May	Commissariat Stores well.	19·6	1·40	·45	·10	Bad	Do. paramecia.
9	Do.	Do.	Regiment office well	37·1	4·27	·16	·08	Good	Do. do.
10	Do.	June	Kankaria tank	29·40	5·60	·96	·76	Bad	Do. do.
11	Do.	August	Sábarmati river	93·80	21·70	·27	·34	Do.	Do. do.
12	Do.	Do.	Ginning Company's well	58·80	10·85	·04	·02	Good	Do. do.
13	Do.	October	Dudeshwar (pit)	12·60	2·03	·03	·06	Do.	Do. fine clay.
14	Do.	Do.	Well in river bed	25·90	3·22	·20	·22	Bad	Do. infusoria abundant.
15	Do.	Do.	Sábarmati river near No. 11.	25·20	5·60	·03	·06	Good	Do. infusoria.
16	Do.	Do.	Railway Pumping Station.	28·00	5·25	·01	·05	Do.	Do. do.
17	Do.	November	Dudeshwar new well	19·6	2·66	·02	·04	Do.	Do. fine sand.
18	Do.	Do.	Tanka	3·5	·91	...	·12	Do.	Do. do.
19	Ajmere	October	Doodea well	52·50	14·70	·03	·23	Bad	Do. do.
20	Do.	Do.	Do.	54·60	14·70	·03	·31	Do.	Do. paramecia.
21	Belgaum	January	Tank	5·4	·56	·08	·38	Do.	Abundant, protozoa.
22	Do	March	Do.	14·7	1·12	·02	·41	Do.	Do. do.
23	Berbera	January	Dubar springs	119·0	36·54	·13	·06	Do.	Scanty.
24	Bijápur	February	Convict Gang well No. 2	17·5	1·79	·08	·14	Good	Scanty, protozoa.
25	Do.	May	New Police lines well	24·5	1·82	·03	·08	Do.	Do. paramecia.
26	Bombay	October	Railway well	19·60	2·45	·01	·13	Do.	Do. do.
27	Do.	March	Tank	29·4	8·54	1·92	·26	Bad	Do. algæ, diatoms and protozoa.
28	Colába	February	Uran Tank	7·0	2·03	·05	·39	Do.	Do. algæ diatoms.
29	Do.	Do.	Phunde do.	11·2	5·67	·19	·46	Do.	Abundant, protozoa.
30	Do.	Do.	Kote well	34·3	4·55	·05	·20	Good	Scanty.
31	Deesa	March	R. A. Hospital well	29·0	3·06	·03	·06	Do.	Do. protozoa.
32	Do.	Do.	Do.	23·1	2·55	·05	·10	Do.	Do. do.
33	Do.	May	Well	28·7	3·78	·13	·09	Do.	Do. paramecia.
34	Dhandhuka	Do.	Dhana váo	149·8	47·60	38·40	1·60	Bad	Do. entomostraca
35	Do.	Do.	Do.	158·9	56·00	·08	·14	Do.	Do. paramecia.
36	Godhra	January	Tank	14·0	1·12	·19	1·50	Do.	Abundant, algæ and protozoa.
37	Do.	Do.	Do.	11·9	1·05	·32	·96	Do.	
38	Do.	Do.	Do	11·2	1·26	·27	·52	Do.	
39	Hyderabad	March	Wádi well	38·5	2·38	·16	·20	Good	Scanty.
40	Do.	May	Seram river	30·8	1·82	·80	·36	Bad	Abundant paramecia.
41	Kalyán	March	Ditch near Kalyán	51·8	10·92	2·14	1·02	Do.	Copious, algæ and protozoa.
42	Karáchi	February	Jail well No. 1	168·7	70·28	·13	·20	Do.	Scanty, rotifera.
43	Do.	Do.	Do. No. 2	151·9	53·43	·13	·18	Do.	Do. protozoa.
44	Do.	September	Chahro water	10·50	·84	...	·03	Good	Abundant, fine clay.
45	Khárághoda	January	New tank	23·8	11·06	·16	·40	Bad	Scanty, protozoa.
46	Do.	May	Do.	54·3	24·71	·40	·90	Do.	Do. do.
47	Nára	February	Booshtán well	57·4	10·08	·32	·22	Do.	Do. vorticella.
48	Do.	Do.	Kinjeri do.	194·6	66·76	·03	·20	Do.	Do. paramecia.
49	Do.	Do.	Well near canal	19·6	·28	·56	·26	Do.	Abundant.
50	Do.	Do.	Do. in bed of canal	16·10	1·64	·61	·19	Do.	Do.
51	Do.	November	New well	44·80	9·66	1·60	·14	Do.	Do.
52	Do.	Do.	Canal water	17·50	1·33	...	·12	Good	Scanty.
53	Násik	February	Visoba's tank	7·0	·84	1·92	·74	Bad	Do. protozoa.
54	Do.	Do.	Kushavrita tank	36·4	6·86	28·16	5·32	Do.	Abundant, protozoa and algæ.
55	Do.	Do.	Kekli well	11·9	1·40	·08	·54	Do.	Scanty protozoa.
56	Do.	Do.	Thákoor's well	11·9	·98	2·56	·68	Do.	Abundant, diatoms and vorticella.
57	Do.	Do.	Moree Bava's well	7·0	·84	·64	·94	Do.	Scanty, protozoa.
58	Do.	April	Pokhari well	29·4	1·96	·48	·46	Do.	Scanty.
59	Do.	June	Anjineri hill well	18·90	·84	1·06	·56	Do.	Abundant, paramecia.
60	Do.	Do.	Do. do. tank	11·90	1·05	·32	1·40	Do.	Do. do.
61	Do.	November	Do. do. well	4·9	·63	·03	·46	Do.	Do. do.
62	Do.	Do.	Do. do. tank	3·5	·63	...	·42	Do.	Do. do.
63	Pánchgani	March	Public well	10·5	1·05	·20	·14	Good	Scanty, diatoms.
64	Do.	Do.	Do.	9·1	·95	·19	·10	Do.	Do. do.
65	Pandharpur	August	Bhima river. Mahádeva Ghát.	6·3	0·7	·08	·12	Do.	Copious, paramecia.
66	Do.	Do.	Ramayeni stand-post (filtered).	22·4	3·57	...	·38	Bad	Do. do.
67	Do.	Do.	Pandharpur tank outside tower.	22·4	3·50	·13	·40	Do.	Do. do.
68	Poona	April	Kartruz water	2·8	·56	...	·06	Good	Scanty.
69	Do.	Do.	Chowdria haud	2·8	·49	·13	·09	Do.	Do. vorticella.
70	Do.	Do.	Canal, unfiltered	2·8	·49	...	·06	Do.	Do.
71	Do.	Do.	Do. filtered	18·2	1·75	...	·07	Do.	Do.
72	Do.	May	River Mula	16·1	2·24	·16	·26	Do.	Do. protozoa.
73	Quetta	February	Club well	18·2	1·96	·11	·23	Do.	Do. do.
74	Do.	Do.	Do.	18·9	2·03	·05	·15	Do.	Do.
75	Do.	Do.	Spring	13·3	1·68	·48	·14	Bad	Abundant.
76	Do.	Do.	Hanna river	7·7	1·19	·29	·14	Do.	Do.
77	Sholápur	July	Ekruk tank	9·1	·91	·03	·12	Good	Scanty, monads and paramecia.
78	Do.	Do.	Do.	11·2	0·77	·03	·14	Do.	
79	Sirár	April	Well	204·4	31·50	·05	·28	Bad	Do. paramecia.

Number.	Station.	Date of Collection.	Source.	Grains per Gallon.		Parts per Million.		Column added by order of Government	Sediment.
				Total Solids.	Chlorine	Ammonia.			
						Free.	Albumenoid.		
80	Sirúr	May	River	21·7	3·50	·04	·32	Bod ..	Scanty, confervæ. and protozoa.
81	Sorath	Do.	Lakhapadar well ...	35·0	4·06	·32	·03	Do. ...	Scanty.
82	Talegaon ...	April	Tank	14·7	1·32	·16	·30	Do. ...	} Abundant, grass pol-
83	Do. ...	Do.	Do.	14·0	1·60	·24	·36	Do. ...	} len and rotifera.
84	Thána	May	Well	18·9	1·82	·13	·17	Good ...	Abundant, paramecia.
85	Zailla	January	Takhusha well	23·1	·70	·24	·06	Do. ..	Abundant.
86	Do.	April	Do.	22·4	3·50	·16	·18	Do. ...	Scanty, paramecia.
			Railway Water.						
87		March	Pundmara well	115·3	41·02	·01	·11	Bad ...	Abundant, rotifera.
88		Do.	Rohera well	106·4	32·48	·34	·22	Do. ...	Scanty, paramecia.
89		May	Lutara nála well ...	176·4	24·50	1·60	1·04	Do. ...	Abundant, vorticella, &c.
90		Do.	Well at mile 379·14 ...	28·0	6·37	·03	·28	Do. ...	Do. paramecia.
91		June	Khirma river well ...	100·1	26·25	·64	·72	Do. ...	Do. do.
92		Do.	Jalia tank	17·5	6·09	·21	·78	Do. ...	Do. do.
93	Rajputána-Málwa Railway.	Do.	Beavur River	141·4	59·36	·64	·48	Do. ...	Do. much clay.
94		Do.	Chitrasui new well ...	73·5	6·30	·08	·44	Do. ...	Do. paramecia.
95		Do.	Do old well ...	112·0	23·94	·03	·20	Do. ...	Do. do.
96		Do.	Dobelas tank	19·6	5·46	1·06	·76	Do. ...	Scanty do.
97		September	River north of Beavur	273·0	94·50	·23	·26	Do. ...	Do. protozoa.
98		Do.	Do. south of do. ...	94·5	37·80	·07	·44	Do. ...	Do.
99		Do.	Well at mile 325·5 ...	37·8	5·60	·20	·32	Do. ...	Do. diatoms and protozoa.
100		October	Well near Dobelas Tank.	338·8	164·50	2·00	1·00	Do. ...	Abundant, paramecia.
101		Do.	Beavur south river ...	104·3	40·25	·03	·22	Do. ...	Do. fine clay.
102		February	Bellary well	32·2	4·48	·11	·24	Bad ...	Scanty, paramecia.
103		Do.	Haspett do.	12·6	1·54	·11	·18	Good ...	Do. do.
104	Southern Maratha Railway.	Do.	Gadegaum do.	43·4	4·20	·16	·20	Bad ...	Do. diatoms and paramecia.
105		May	Kopbal do.	91·0	12·74	·05	·18	Do. ...	Scanty.
106		Do.	Banapur do.	30·1	1·82	·02	·11	Good ...	Do. sandy.
107		Do.	Ekki nála	75·6	3·50	·02	·18	Bad ...	Do. protozoa.
108	Sind, Punjáb and Delhi Railway.	August	Rumpotham new well...	212·1	102·20	·16	·36	Do. ...	Abundant, more as the good

Section III.—Government Stores.

40. The articles coming under this description examined during the under report comprised:—

Commissariat Stores.

Samples of Malt Liquor	...	100	
,, Tea	...	22	
,, Soap	...	57	
,, Lime-juice...	...	22	
,, Sugar	...	28	
,, Preserved Provisions	...	4	
,, Sundry articles of food ...	...	9	
,, Disinfectants	...	10	
,, Oils	...	7	
			259

Ordnance Stores.

Samples of Mercuric Fulminate	...	55	
,, Metals and alloys	...	13	
,, Bees' Wax and Shell Lac ...	...	9	
,, Sundry chemicals	...	12	
			89
			348

The corresponding number for 1884 was 384. During the year under report, however, in addition to the 348 samples shown in the above list, a very large number of samples of Commissariat Stores intended for the supply of the Suakin force were examined at a branch temporary laboratory established by this Department at the Prince's Dock. This branch laboratory was under the charge of Surgeon Milne, I. M. D., temporarily attached to this Department for the duty.

41. *Malt Liquor.*—Of the 100 samples of malt liquor examined during the year under report, 36 were samples from six consignments of porter and ale imported by Government for the use of troops. These 36 samples were taken—2

per cask—from 8 casks of ale and 10 of porter, one sample being drawn on arrival of the consignment and the other six days after landing it. The table below shows the results obtained on examination of the second drawn sample from each cask:—

Brewery Number.	Description of Liquor.	Extract Gravity.	Beer Gravity.	Original Gravity.	Alcohol by volume per cent.	Acidity as Hydrated Acetic Acid per cent.
1 ...	Ale ...	1014·8	1005·0	1059·2	7·10	·28
,, ...	do. ...	1015·2	1005·3	1060·1	7·10	·21
,, ...	do. ...	1015·8	1006·0	1069·8	7·03	·20
,, ...	do. ...	1014·5	1004·6	1068·9	7·10	·18
2 ...	do. ...	1015·5	1005·6	1059·9	7·10	·20
,, ...	do. ...	1016·3	1006·5	1060·3	7·03	·20
,, ...	do. ...	1014·3	1005·5	1053·1	6·25	·18
,, ...	do. ...	1013·6	1004·8	1052·4	6·25	·18
1 ...	Porter ...	1015·6	1006·2	1058·1	6·72	·36
,, ...	do. ...	1015·5	1006·1	1058·0	6·72	·34
,, ...	do. ...	1013·6	1003·9	1059·0	6·96	·37
,, ...	do. ...	1013·9	1004·3	1058·8	6·87	·38
,, ...	do. ...	1014·8	1005·5	1066·3	6·64	·36
,, ...	do. ...	1014·8	1005·3	1067·3	6·80	·37
3 ...	do. ...	1020·0	1011·1	1059·4	6·33	·23
,, ...	do. ...	1019·8	1011·0	1058·6	6·25	·22
,, ...	do. ...	1019·3	1010·5	1058·1	6·25	·21
,, ...	do. ...	1019·2	1010·4	1058·0	6·25	·31

42. Fifty-eight more of the samples, *viz.*, 49 of ale and 9 of porter, were samples of Government imported malt liquor sent from various stations and alleged to have become unfit for issue. In 16 of these, *viz.*, 9 of ale and 7 of porter, the acidity had risen (reckoned as acetic acid) to ·45 per cent. or over; 24—all samples of ale—had an acidity of between ·35 and ·45 per cent.; and in the remaining 18 the acidity was under ·35 per cent. Four more of the samples were sent from Nasirabad and consisted of one sample each of ale and porter from the Commissariat Stores, and a regimental Canteen, the question being whether the latter showed any inferiority of quality as compared with the former. On examination the Canteen samples proved to be quite as good as the Commissariat Store samples.

The last two samples were specimens of Mussoorie-brewed ale and porter; these gave the following results:—

	Ale.	Porter.
Beer gravity	1009·1	1007·4
Extract gravity	1021·1	1020·1
Original gravity	1076·0	1079·5
Alcohol by volume per cent.	8·74	9·41
Acidity as acetic acid per cent.	·20	·23

43. *Tea.*—Of the 22 samples of tea—all Indian—examined during the year, it was found necessary to reject 11, or exactly one-half. The average results obtained on examination of the 11 accepted samples were as follows:—

Specific gravity of a ten per cent. decoction	1009·9
Soluble ash per cent.	3·36
Insoluble do.	2·70
Total ash do.	6·06

44. *Soap.*—The 57 samples of soap examined during the year were all of Bombay manufacture and comprised 7 samples of tablet soap, 11 samples of soft soap, and 39 samples of bar soap. The quantity of water present in the 7 samples of tablet soap ranged from 17·2 to 27·5 per cent. One of the samples of soft

soap contained just under, and another just over, 20 per cent. of water, another contained 32 per cent., and the remainder from 38·4 to 46·2 per cent. of water. Of the 39 samples of bar soap 4 contained between 20 and 30 per cent., 11 between 30 and 40 per cent., 20 between 40 and 50 per cent., 3 between 50 and 60 per cent., and 1 over 60 per cent. of water.

45. *Lime-juice.*—Eight samples of fortified, and 14 samples of unfortified lime-juice were examined during the year; four of the latter were rejected on the ground of inferiority of quality. All the accepted samples of unfortified lime-juice contained over 6 per cent. of free citric acid, the average for the 10 accepted samples being 6·49 per cent.

46. *Sugar, Preserved Provisions, and sundry articles of food.*—Twenty-eight samples of sugar, 4 samples of preserved provisions, and 9 samples of sundry articles of food were examined during the year: none of these examinations call for any special remark.

47. *Disinfectants, &c.*—The 10 samples of disinfectants comprised: (1) 7 samples of Calvert's disinfecting powder,—all of which were found to contain as required by contract over 10 per cent. of carbolic acid; (2) a sample of liquid phenyl found to be of good quality; and (3) one sample each of Calvert's soluble cresol, and Little's soluble phenyl, sent for comparison as to antiseptic power. No difference could be traced between the liquids in this respect. Both were added (*a*) to milk and (*b*) to a boiled 5 per cent. decoction of wheat flour, the proportions used being in one set of experiments ·25 and in another ·50 per cent. The general result was as follows: The liquids being kept at the temperature of the air it was found that when only ·25 per cent. was added fermentation began in the liquids under experiment in less than 24 hours. When ·50 per cent. was added, fermentation was considerably delayed, not appearing in the case of the milk until nearly 72 hours had elapsed. Two samples of kerosine and 5 samples of oil were examined. The samples of kerosine flashed respectively at 79° and 77° Abel. Of 5 samples of oil examined 1 was a sample of Neat's foot oil forwarded for determination of its weight per gallon. The specific gravity of the sample at 79°F. was found to be 9181, equal to a weight at this temperature of 9lbs. 2oz. and 397 grains, per gallon. The other 4 samples were sent for examination as to quality. Of these 2, *viz.*, 1 sample of Neat's foot oil and 1 sample of Colza oil, were rejected as not genuine.

48. *Ordnance Stores.*—The following were examined for the Small Arms Ammunition Factory at Kirkee, (1) 55 samples of mercuric fulminate, all of which save one, proved to be free from acidity: all were of good quality. (2) 11 samples of metals and alloys: these were quantitatively examined and comprised 7 samples of lead, 10 of tin, and 2 of an alloy of lead and tin. (3) 5 samples of Bees' wax and 4 samples of shell lac: all these proved to be of good quality. (4) 11 samples of sundry chemicals, *viz.*, 4 samples of spirits of wine, 3 of potassic chlorate, 2 of nitric acid, and 1 each of antimony, sulphide and sulphuric acid. All 11 samples were found to be of the quality required. Lastly, one sample of rain water was examined at the request of the Superintendent of the Government Powder Factory. This, it was stated, it was proposed to use instead of distilled water in the refining of saltpetre. On examination the total dissolved solids present in the sample were found not to exceed ·7 grains per gallon.

Section IV.—Customs and A'bka'ri Analyses.

49. During the year under report 576 samples of various substances were forwarded for examination by the Customs and A'bkári departments. These comprised:—

Samples of alcoholic liquids	...	25
„ Opium and Ganjah	...	35
„ Salt ...	...	16
„ Explosives	...	36
„ Petroleum	...	464
		576

50. *Alcoholic Liquids.*—Of the 25 samples of alcoholic liquids examined six were samples of so-called "Eau de Cologne" forwarded by the Collector of Customs, Bombay. One of these samples consisted of six small bottles (under four ounces in capacity) labelled "Eau de Cologne Royale, Kopings Teknista Fabriks Aktie-Bolag". The liquid in these bottles was simply a slightly scented mixture of spirit and water containing alcohol equal to 64·3 per cent. of proof spirit. The other five samples were all taken from one consignment of 250 dozen bottles of a similar liquid. These bottles were like those just described of under four ounces in capacity, were labelled "Johann Maria Farina Gegenuber dem Laurenz Platz", and contained a slightly scented mixture of spirit and water of an alcoholic strength equal to 66·8 per cent. of proof spirit. As mentioned in previous reports, there is little doubt that this so-called Eau de Cologne is imported solely for sale as a potable spirit. Being however slightly scented, described as Eau de Cologne, and contained in bottles of under four ounces capacity, it entirely escapes spirit duty. At one time apparently, the employment of liquor of this description for potable purposes was chiefly confined to Bombay, and districts in the immediate neighbourhood. I have, however, lately received a letter from the Collector of Dhulia, forwarding a bottle of so-salled Eau de Cologne, similar to those just described, and asking that it might be examined, as a country liquor contractor in his district has lodged a complaint with him, that his business is interfered with, by persons who sell this liquid as an alcoholic drink. Of the remaining 19 samples, one was a sample of Old Tom forwarded in order that its alcoholic strength might be ascertained, this being masked by a quantity of sugar present in the liquor. Another was a sample of mowra spirit sent by the Á'bkári Supervisor at Uran, the question being whether or no it had been diluted with water after distillation. The liquid was of low alcoholic strength (59·25 per cent. under proof) and was found to contain combined chlorine equal to 8·30 grains per gallon of chloride of sodium. It was therefore probable that it had been diluted after distillation. The remaining 17 were samples of medicinal and other preparations forwarded by the Collector of Customs, Bombay. Of these nine were found to contain no alcohol, two contained less than 20 per cent. of proof spirit, and six were found to contain more than 20 per cent. of proof spirit, and to be therefore liable to spirit duty.

51. *Opium and Gánja.*—During the year under report 26 samples of opium were sent by the Collectors of various districts to be examined for adulteration. Of these 18 were sent by the Collector of Kaira, 12 of which proved to be adulterated; four more, all adulterated, were sent from the Ahmedabad District; two more, both free from adulteration, were sent from the Khándesh District; one, unadulterated, came from Sátára District; and, lastly, one adulterated sample was sent from Nevása (Ahmednagar District). Six samples of substances suspected to contain opium were examined. Five of these were samples of pills forwarded from Ahmedabad. Opium was found to be present in one sample out of the five. The sixth was a specimen of so-called opium oil sent for examination by the Customs Department, Bombay. This, like samples examined in previous years, proved to be a sample of a vegetable oil, which had probably been used for softening old opium, and had thereby acquired the colour and odour of the drug. Two samples of opium were examined for a merchant's firm. Both proved to be, although rather soft in consistence, of good quality. The percentage of water present in the two samples was respectively 12·85 and 13·95. The dried samples yielded respectively 69·2 and 75·2 per cent. of dry watery extract and yielded to Hager Jacobsen's process respectively 7·70 and 8·52 per cent. of morphia. One sample of gánja was examined at the request of the Á'bkári Inspector, Sholápur. It proved, although rather old, to be free from adulteration.

52. *Salt.*—Fifteen samples of salt were examined at the request of the mixed Commission which met at Goa during the early part of the year. Of these six were samples of recently made Bombay salt, and nine samples of Goa made salt, three made during 1885, and six made during 1884. As will be seen from the table below, all the Goa made samples contained more insoluble residue than the Bombay samples, and the recently made Goa samples, all lost largely on incineration and contained much magnesium chloride. One sample of a substance called sanchal khár was forwarded by the Collector of Customs, Karáchi; this on examination was found to contain 97·7 per cent. of common salt:—

	Loss on Incineration.	Analyses of the incinerated Samples.					
		Common Salt.	Insoluble Residue,	Magnesium Chloride.	Calcium Sulphate.	Magnesium Sulphate.	Sodium Sulphate.
Bombay Salts, 1885—							
Mátunga, coarse	10·56	97·01	·65	·79	·33	1·22	...
Do. fine	6·02	98·50	·36	...	·58	...	·56
Uran, coarse	9·31	96·41	·85	·63	·55	1·56	...
Do. fine	8·57	97·41	·71	...	·92	...	·96
Ghorebandar, coarse	7·65	97·62	·76	·35	·90	·37	...
Do. fine	6·89	97·28	·67	...	·56	...	1·49
Goa Salts, 1885—							
Táluka Sálsette...	12·18	95·26	1·30	1·28	1·55	·61	...
Do. Bárdez	20·46	91·55	2·25	2·36	2·67	1·17	...
Do. Ilhas	18·74	90·18	1·60	3·94	2·89	1·39	...
Goa Salts, 1884—							
Táluka Sálsette, No. 1	1·77	97·21	1·64	·13	1·02	...	...
Do. do. No. 2	1·54	97·37	1·83	...	·40	·40	...
Do. Bárdez, No. 1	9·39	95·83	1·58	...	·87	1·72	...
Do. do. No. 2	9·01	95·62	1·50	·10	1·13	1·65	...
Do. Ilhas No. 1	8·60	96·42	1·52	·13	1·56	·37	...
Do. do. No. 2	8·91	96·63	1·36	...	1·63	·38	...

53. *Explosives.*—Thirty-three samples of dynamite were examined during the year. Of these 15 were of English and 18 of foreign manufacture. All proved free from exudation, and passed the "heat test". Three samples of blasting gelatine of English manufacture were also examined, and found to be of satisfactory quality.

54. *Petroleum.*—Four hundred and sixty-four samples of petroleum were examined under the provisions of the Petroleum Act, during the past year. Of these 440 were samples taken from the cargoes of the 25 petroleum-laden ships which arrived at Bombay from America during 1885. These ships brought altogether about 1⅓ million cases. The whole of the 440 samples were found to flash above the legal minimum of 73° (Abel). Only 14 of the 440 were found to flash below 76°, *viz.*, 11 flashing at 75° and three flashing at 74°. The results of the Bombay testing of the cargoes of these 25 ships, as compared with the American certificates which accompanied the same, are shown in the table which follows :—

Minimum Abel flash stated on American Certificate.	Bombay Results.			
	Number of Samples flashing below 76° Abel, *viz.*, at		Average Abel flash of Cargo.	Remarks.
	74°.	75°.		
None	...	2	76	Oil certified as 115° fire test.
76	...	...	76	Do. 76° to 78° Abel.
76	2	4	76½	
76	1	...	76½	
76	...	...	77	Oil certified as 76° to 78° Abel.
76	...	3	77	
76	...	...	77½	
76	...	...	78	
76	...	1	78	
76	...	...	78	Oil certified as 76° to 78° Abel.
76	...	...	78	Do. 76° to 79° do.
76	...	...	78	Do. 76° to 79° do.
76	...	...	78	
76	...	...	78	
76	...	...	78½	
76	...	...	79	
76	...	...	79	

Minimum Abel flash stated on American Certificate.	Bombay Results.			Remarks.
	Number of Samples flashing below 76° Abel, *viz.*, at		Average Abel flash of Cargo.	
	74°.	75°.		
76	...	...	79	
76	...	...	80	
76	...	...	80	
77	...	...	77⅔	Oil certified as 77° to 78° Abel.
77	...	...	79	Do. 77° to 79° do.
77	...	...	78	Do. 77° to 79° do.
78	...	1	76¼	Remaining samples all flash at 76° or 77°.
79°	...	...	77	Oil certified as 79° Abel. All samples flashed at 77° or 78° Abel.
25	3	11	...	

From the above table it will be seen that 19 of the 25 cargoes were certified to have a minimum Abel flash of 76°F. Of these 19, fourteen yielded no samples flashing under this certified minimum. One yielded six samples flashing under 76°, *viz.*, 2 at 74° and 4 at 75°. Another yielded three samples flashing under 76°, *viz.*, 3 flashing at 75°. A third cargo yielded one sample flashing at 74°; and a fourth one sample flashing at 75°, all the other samples flashing at 76° or above. The average flash point of the samples taken from these 19 cargoes was in—

3	cargoes	... ...	76° and under	77°
3	,,	... ...	77° ,,	78°
8	,,	... ...	78° ,,	79°
3	,,	... ...	...	79°
2	,,	... ...	...	80°
19				

Of the remaining six cargoes one certified to consist of 115° fire test oil—no Abel flash point being stated on the certificate—yielded two samples flashing at 75°. All the other samples from this cargo flashed at 76° or above, the average flash point of the whole being 76°. Three more were certified to consist of oil flashing at 77° to 79° (Abel), and the samples from these cargoes corresponded exactly to the certificates. The fifth, a small consignment of 13,587 cases, was certified to have a minimum Abel flash of 78°. All the samples from this cargo, except one which flashed at 75°, flashed at 76° or 77°, the average of the whole being 76¼°. The last cargo was accompanied by a certificate stating that a sample of it had been examined and had been found to flash at 79° (Abel). All the samples from this cargo however flashed at 76° to 78°, the average being 77°.

55. Twelve more of the samples of petroleum were samples taken from cargoes of ships which arrived from America at the end of 1884 but of which the discharge and testing was not completed until 1885. All these flashed at above 73°. The remaining twelve were miscellaneous samples, and comprised (1) Six samples from as many small consignments received from England,—all these samples flashed at over 73°. (2) Four samples from two consignments received from the Persian Gulf; these all flashed at 84° to 85°: and (3) Two samples from a consignment of 550 cases of Russian petroleum; both of these flashed at 88°.

Section V.—Miscellaneous.

56. The 67 examinations of articles coming under this head comprised—

Samples of	water	5
Do.	limestones and limes	26
Do.	miscellaneous minerals	12
Do.	sundry substances	45
		88

57. *Water.*—Sixteen of the 21 samples of water received from various Railway authorities were further examined, as to their fitness for use in locomotive boilers. The results obtained from these are shown in the table which follows (2 to 17). Five other samples of water were examined with the view of ascertaining their fitness for use for purposes other than drinking. These were (1) A sample of well water (Analysis No. 1) sent by the Executive Engineer, Ajmere Division, Rájputana-Málwa Railway; and (2) Four samples (Analyses Nos. 18 to 21) forwarded by the Political Agent, Cutch, the question being as to their fitness or otherwise for agricultural purposes:—

No.	Forwarded by	Source.	Grains per Gallon.					
			Total Solids.	Chlorine.	Sulphuric Acid.	Silica.	Lime.	Magnesia.
1	R. M. Railway ...	Sali well	396·2	167·16	24·36	1·96	10·50	7·84
2	Do.	Pundwara well	115·3	41·02	4·69	1·96	5·67	6·79
3	Do.	Rohera do.	106;4	32·48	5·53	5·18	11·83	10·57
4	Do.	Lutara nála do.	176·40	24·50	13·44	1·96	3·32	Nil
5	Do.	Mile 379-14 do.	28·00	6·37	1·12	2·10	5·74	Nil
6	Do.	Khirwa river do.	100·00	26·25	7·28	2·66	8·82	3·92
7	Do.	Beavur river do.	141·40	59·36	15·58	0·84	10·08	5·88
8	Do.	Chitrasni new do.	73·50	6·30	5·04	7·00	4·20	2·66
9	Do.	Do. old do.	112·00	23·94	1·77	5·88	6·30	8·40
10	Do.	River N. of Beavur	273·00	94·50	17·85	3·78	30·10	16·73
11	Do.	Do. S. of do.	94·50	37·80	9·03	1·12	6·09	3·43
12	Do.	Dobela's tank well	338·80	164·50	5·18	1·82	6·02	3·01
13	Do.	South River Beavur	104·30	40·25	12·32	·56	9·87	4·41
14	S. M. Railway ...	Kopbal Station well	91·00	12·74	7·77	4·20	3·29	4·34
15	Do.	Bamapur do. do.	30·10	1·82	0·77	3·92	4·13	0·84
16	Do.	Ekki nála well	75·60	3·50	5·92	2·10	1·61	Traces
17	S. P. & D. Railway .	Rumpetham new well... ...	212·10	102·20	6·93	1·68	16·52	12·25
18	Political Agent, Cutch.	Nik near Bagicha	116·90	79·82	11·06	...	...	...
19		E. well near the Vidi	57·40	24·91	3·36	...	...	...
20		2nd Dhro	107·80	51·67	12·11	...	...	...
21		Pampinalo Dhro	117·40	66·67	12·39	...	...	...

58. *Limestones and Limes.*—Twenty-three samples of limestone, and 3 samples of lime, were examined during the year with the results shown in the annexed table. Of the samples of limestone No. 1 was a sample of kunkur forwarded by the Executive Engineer, Northern Circle, and described as from the Government works at Bhatgarh. Nos. 2 to 6 were sent by the Executive Engineer for Irrigation, Gujarát, and were stated to be from, No. 2 Bhitali, No. 3 Moondetta, No. 4 Malasa, No. 5 Mhow, and No. 6 Bhownath dam site. Nos. 7 to 9 were examined at the request of the Agent, W. I. Portuguese Railway, and Nos. 10 to 23 at the request of the Executive Engineer, Tánsa Survey. Of the samples of lime No. 24 was sent by the Executive Engineer, Ahmedabad, and was described as lime obtained from kunkur collected on the banks of the Bhagavo River, and Nos. 25 and 26 were forwarded by the Agent, W. I. Portuguese Railway:—

Number of Sample.	Sand, &c.	Silicic Acid.	Ferric Oxide and Alumina.	Carbonate of Lime.	Carbonate of Magnesia.
1	22·61	18·76	14·80	41·52	·69
2	3·00	·06	1·00	54·53	41·41
3	11·92	1·83	2·56	82·20	1·49
4	3·03	·86	1·20	93·19	1·72
5	16·92	2·69	2·21	76·17	2·01
6	22·22	9·42	3·22	63·10	2·04
7	5·81	·33	3·17	58·54	32·15
8	12·54	·59	3·31	57·29	26·27
9	3·69	1·41	2·08	92·82	Traces
10	6·48	8·34	8·07	76·00	1·11
11	3·80	5·65	5·10	80·64	4·81
12	5·90	4·52	7·18	76·71	5·69
13	4·31	10·01	7·21	75·36	3·11
14	6·07	6·50	5·27	76·83	5·31
15	7·95	7·49	6·68	76·22	1·66

Number of Sample.	Sand, &c.	Silicic Acid.	Ferric Oxide and Alumina.	Carbonate of Lime.	Carbonate of Magnesia.
16	6·74	6·98	5·33	77·94	[illegible]
17	3·97	6·41	5·32	81·87	2·4[illegible]
18	4·83	6·22	5·07	81·85	4·03
19	3·63	7·55	6·69	77·70	4·43
20	6·50	7·95	6·31	76·55	2·70
21	3·58	5·32	4·50	82·59	4·01
22	5·36	5·84	5·44	83·36	Nil.
23	5·06	7·28	7·47	80·90	Nil.

				Lime.	Magnesia.	Carbonic Acid.	Water.
24	32·83	17·45	12·25	31·35	2·39	2·66	1·07
25	18·81	9·13	9·59	47·49	Traces	7·27	7·66
26	6·09	2·81	4·37	58·29	Do.	16·31	12·13

59. *Miscellaneous Mineral Substances.*—Twelve samples of miscellaneous mineral substances were examined during the year. These consisted of (1) Six samples of Aden pumice examined at the request of the Bombay Port Trust for percentage of gypsum present. This ranged in the six samples from 7·89 to 13·87 per cent. (2) One sample of white clay and two samples of ochreous earths forwarded from Dwárka by the Baroda State, the question being as to their suitability for use as pigments. (3) A sample of clay reputed to be a cure for leprosy forwarded by the Executive Engineer for Irrigation, Gujarát, and a sample of supposed coal forwarded by the same, but which on examination was found to contain no bituminous matter. (4) A sample of salt alleged to be a natural product, forwarded by a Magistrate in the Sátára District.

60. *Sundry Substances.*—The 45 examinations coming under this head included (1) Six samples of oil made by the Bombay Oil Company, forwarded by Government for examination and report. These consisted of one sample each of "amber, gingelly, castor, cocoanut, linseed, and colza oil." All appeared to be of good quality. Their specific gravities at 84° F. was respectively 9178, 9158, 9545, 9178, 9463 and 9106. The melting point of the cocoanut oil was 73° F. (2) Nine samples of dyed cloth examined with reference to the case of spontaneous ignition occurring on the Rájputána-Málwa Railway referred to in paragraph 60 of my report for 1883. (3) A sample of hewra (Acacia leucophlœa) bark, forwarded by the Collector of Kánara, the question put in regard to it being as to the reason of its use in the distillation of country liquor. This bark contains much tannic acid and in consequence precipitates the albuminous matters of the juices from which such liquor is distilled; hence its employment for the purpose stated. (4) Five samples of country liquor sent by the Civil Surgeon, Shikárpur, the question being as to their fitness or otherwise for potable purposes. These ranged in strength from 47·6 to 24·0 per cent. under proof. All contained copper in minute quantity. (5) A sample of wine examined at the request of one of the Presidency Magistrates, Bombay, the question being as to whether it was or was not an alcoholic liquid. On examination it was found to contain alcohol in small quantity, the amount present being equal to 14·1 per cent. of proof spirit. (6) One sample of soda water and one of lemonade forwarded by the medical officer in charge of the Station Hospital, Deesa; both proved to be of good quality. (7) Three samples of ghee, one forwarded by the Civil Surgeon, Dhulia, and two by the Magistrate of Yeola, the question being as to their fitness or otherwise for food. (8) A sample of arrowroot made at Dápoli in the Ratnágiri District; this proved to be Maranta arrowroot of good quality. (9) Eleven stamped covers sent by the Postmaster General, Bombay, the question being whether the postage labels thereon had been previously used and the obliterating stamp

marks effaced therefrom. Examination of the covers however and experiments made on the possibility of removing obliterating stamp marks, showed that it was highly unlikely that such removal had been effected. (10) A cholera pill forwarded by the Collector of Aurangabad; this appeared to consist chiefly, if not entirely, of assafœtida and opium: and (11) A sample of sulphate of quinine forwarded by the Deputy Surgeon-General, Mhow, suspected to be adulterated but which on examination proved to be pure.

61. In conclusion it only remains for me to state that during the year under report Assistant Surgeon M. G. Deshmukh, M.D., B.A., B.Sc., Assistant Chemical Analyser to Government, has, as in previous years, afforded me most efficient and valuable assistance in carrying out the duties of this Department.

I have the honour to be,
Sir,
Your most obedient Servant,

I. B. LYON, F.C.S., F.I.C., Surgeon-Major,
Chemical Analyser to Government.

Annual Reports: Report of the Chemical Analyser to Government for the year 1885.

No. 2187.

GENERAL DEPARTMENT.

Bombay Castle, 21st June 1886.

Memorandum from the Surgeon General with the Government of Bombay, No. 2169, dated 3rd May 1886—Submitting, with his remarks, the report of the Chemical Analyser to Government for the year 1885.

RESOLUTION.—The number of medico-legal cases referred to the Chemical Analyser for report during the year under review was 336 as compared with 314 last year. The total number of articles examined or analysed during the year under review was 2,183 as compared with 1,993* in the previous year. This is exclusive of a large number of samples of Government stores examined by Surgeon Milne in connection with the Suakim Expedition. Among the medico-legal cases there were 48 cases of examination of articles supposed to be stained with blood or other animal fluids. In 28 of these only was blood detected.

2. The number of cases of real or alleged poisoning of human beings in connection with which substances were sent for analysis was 187 in the year under review as compared with 169 in the last year. Out of these poison was detected in 102 or 54·5 per cent. of the cases as compared with 83 or 49·1 per cent. last year. In two cases of suspected poisoning no trace of poison was detected. In two other cases, one from Vengurla and another from Tatta (Sind), arsenical poisoning, which was the cause of death, does not seem to have been suspected until the state of the stomach was disclosed by *post-mortem* examination. The number of persons who appeared to have been poisoned in the cases in which substances were analysed was 153, of whom 64 died. The districts of Dhárwár, Sátára and Poona show the largest number of cases of human poisoning. As usual, arsenic was the poison most generally used, it having been administered to 51 persons, of whom 32 died. There were 20 cases of opium poisoning of which 18 proved fatal, while of the 5 cases of dhatura poisoning none were fatal. Government regret to notice that notwithstanding the caution enjoined in Government Resolutions No. 1592, dated 14th May 1884, and No. 2117, dated 6th June 1885, passed on the Chemical Analyser's reports for 1883 and 1884, the information supplied to him by district officers with cases of suspected poisoning is still in many cases inexact and meagre. All details necessary to enable the Chemical Analyser to form a decided opinion on the point submitted to him should invariably be furnished with each case.

3. The number of cases of suspected poisoning of cattle was 101, being 2 less than in the previous year. In 54 of these, representing the poisoning of 60 animals—all horned cattle—poison was detected. Belgaum with a blank record for the previous four years appears on the list with 6 deaths. There was an increase in the number of animals poisoned in the districts of Ahmednagar, Kaládgi, Poona, Sholápur and Surat, while the districts of Sátára, Khándesh and Násik show a decrease in this respect. The poison used in the great majority of cases was, as usual, arsenious-oxide, though in one case from Poona strychnia and in two cases from Sátára the seed kernels of Cerbera thevetia or yellow oleander, a poison apparently new to the Bombay laboratory, were detected.

4. During the year under review 108 samples of potable water were analysed and examined as compared with 98 in the previous year. Of these 69 samples were pronounced bad and 39 good. The specimens that came from a well at Dhandhuka and from the Kushávarta tank at Trimbak were very bad. This tank has been emptied out and thoroughly cleaned in the year under review.

* The figure given in the Report for 1884 and in Government Resolution No. 2117, dated 6th June 1885, passed on it, was 1,895, but this is a mistake for 1,993.

Digitized with financial assistance from the Government of Maharashtra on 11 July, 2017

to be extremely bad. The
A sample from a ditch at Kalyán was pronoun
attention of the Collector of Thána should be
of the Mahomedan rice-merchants at Kaly
grain in this ditch previous to grinding i

5. The number of samples of
food examined during the year und
previous year. 576 samples we
and Customs Departments
samples of two brands of E
perfumed mixture of spir
states that these liquid
consumption would
Bombay. Of the
warded from K

awn to the insanitary practice
ho, according to Mr. Lyon, wash

ernment stores and articles of human
review was 348 or 36 less than in the
also examined at the request of the A'bkári
compared with 493 last year. Among these
de Cologne were examined, and proved to be a
and water of high alcoholic strength. Mr. Lyon
re solely imported for sale as potable spirits, and their
em to be extending beyond the limits of the City of
mples of opium examined more than half the number for-
a and Ahmedabad were found to be adulterated.

6. 464 samples of petroleum were also tested during the year under review, w
the result that in all cases the flashing point was above the legal minimu
of 73° (Abel).

7. There is a general tendency to increase in the number of cases sub-
mitted to the Chemical Analyser. Mr. Lyon has brought his accustomed industry and care to bear on his work and has submitted his usual businesslike report. The thanks of Government are also due to Surgeon Milne and to Assistant Surgeon M. G. Deshmukh, Assistant Chemical Analyser, for the assistance rendered by them.

H. T. OMMANNEY,
Acting Under Secretary to Government.

To

The Surgeon General with the Government of Bombay,
The Sanitary Commissioner,
The Municipal Commissioner for the City of Bombay,
The Commissioner of Police, Bombay,
All District Superintendents of Police,
All Collectors, including the Collectors and Deputy Commissioners in Sind,
The Commissioner in Sind,
The Commissioner, N. D.,
The Commissioner, C. D.,
The Commissioner, S. D.,
The Commissioner of Customs, Salt, Opium and A'bkári,
The Revenue Department of the Secretariat,
The Judicial Department of the Secretariat,
The Political Department of the Secretariat,
The Military Department of the Secretariat,
The Compiler, General Administration Report for 1885-86.
The Director of Agriculture,
The Editors' Table, Bombay,
The Branch Editors' Table, Poona, *care of* the City Magistrate, Poona,
The Editor, *Dhárwár Vrit* (for his own use and for the use of other Editors of Newspapers in Dhárwár),

} With copies of the report.

The Secretary of State for India,
The Government of India.

} By letter.